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SCOTT A STINEBRUNER
WOOD HERRON & EVANS LLP
2700 CAREW TOWER
441 VINE STREET
CINCINNATI, OH 452022917

EXAMINER
SCHNEIDER, JOSHUA D

ART UNIT	PAPER NUMBER
2182	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/456,211	Applicant(s) ARMSTRONG ET AL.	
	Examiner Joshua D Schneider	Art Unit 2182	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 December 1999* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12/07/99* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "54" and "56" have both been used to designate entries in a queue. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The examiner suggests having the pointer to the task queue 54 point to the outside of the queue instead of to an individual entry. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "60" and "62" have both been used to designate entries in a queue. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The examiner suggests having the pointer to the position queue 54 point to the outside of the queue instead of to an individual entry. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "70" and "72" have both been used to designate entries in a data structure. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The examiner suggests having the pointer to the request data structure 70 point to the outside of the structure or an enclosing line around the structure instead of to an individual entry. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "10" has been used to designate both computer system and in Fig. 2, a computer system with attached DASD. The examiner suggests that the arrow in Fig. 2 be

lengthened to connect more specifically to the box surrounding the computer system defined in Fig. 1. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1-2, 9-16, and 20-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,644,786 to Gallagher et al. in view of the applicants admitted prior art. With regards to claims 1, 2, 9, 10, and 12, the Gallagher et al. reference teaches the gathering of requests from a plurality of requestors (column 1, lines 19-22, and also Fig. 3), the motion of these requests from one queue to a second queue (column 4, lines 8-9), the sorting of a movable packet of requests by position (column 2, lines 8-12), and the issuing of the movable packet of requests (column 4, lines 1-3 and 8-9). Gallagher et al. also discloses that (column 1, line 26-32)

a queue can be maintained by a system scheduler for each I/O devise of the system and that, "The order in which the process requests are stacked and executed may vary from the order in which the requests are received by the scheduler in order to make the most efficient use of the I/O device or to provide preferential scheduling of higher priority requests." Although it may be implied as one of several scheduling design options, Gallagher et al. fails to specifically teach the sorting of the requests by requesters. The applicant admitted prior art (page 2, line 16-26) teaches a "scheduling algorithm, often referred to as a 'fair' algorithm, attempts to schedule requests in a round robin fashion according to the various identities of the requestors associated with the requests such that each requestor in a system is able to use the DASD 'fairly', and not unduly stall other requestors attempting to access the DASD." The reference also fails to teach the sorting by the position to take place in the second queue.

8. It would have been obvious to one of ordinary skill in the art to combine the described instant applicant described fair algorithm with the two queue position sorting algorithm of Gallagher et al. to create a method which gathered access requests are sorted by requester to create a first ordered set, moved from a first queue to a second queue, sorted by relative position on a storage device to create a second ordered set, and issued and removed from a second cue in order to create a system which gives fair and efficient access to a storage device. It also would have been obvious to one of ordinary skill in the art that the sorting by position could take place in either the first queue or the second queue of the disclosed system of the Gallagher et al. reference without changing the system function.

9. Regarding claim 11, the Gallagher et al. reference discloses a number of elevator sorting methods, and that schedulers may stack and execute requests in a way that varies from the way in

which they are received to provide preferential scheduling according to prioritizing methods. While the fair scheduling method is not disclosed by the reference, it is disclosed by the instant applicant to be well known in the art at the time of invention. It would have been obvious to one of ordinary skill in the art at the time of invention to sort using one of two well known methods, the fair method and the elevator method, and to then sort by the other of the methods in order to give a desired priority to certain requests according to the position and the requestor associated with the request.

10. Regarding claim 13, the Gallagher et al. reference discloses (Fig. 3) a memory, as part of a central processing unit, and a program resident on this memory. The program is disclosed to meet the limitations of sorting of the plurality of access requests by position and the issuing of the sorted requests, but fails to specifically disclose the sorting of the requests by requestor. It would have been obvious to one of ordinary skill in the art, at the time of invention to combine the implementation of a fair requestor sorting method in order to provide more efficient disposal of all tasks (column 1, line 23-32), with the rest of the disclosed invention of Gallagher et al.

11. Regarding claims 14 and 15, the Gallagher et al. reference discloses that the scheduler may vary the way that the requests are executed from the way they are gathered, the sorting of these first set of requests by position to create a second ordered set, and the issuing of the requests from the second set. The reference fails to teach that the gathered requests should be sorted with the well known fair algorithm, but does teach that sorting to give preferential scheduling may first occur (column 1, line 26-32) to give a higher priority to certain requests. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the well known fair algorithm with the invention of Gallagher et al. in order to

fashion a system which provides for scheduling of the highest priority request of each requestor to be read in a sequential manner according to the respective positions to the requests.

12. With regards to claim 16, the Gallagher et al. reference teaches the gathering of requests from a plurality of requestors (column 1, lines 19-22, and also Fig. 3), the motion of these requests from one queue to a second queue (column 4, lines 8-9), the sorting of a movable packet of requests by position (column 2, lines 8-12), and the issuing of the movable packet of requests (column 4, lines 1-3 and 8-9). Gallagher et al. fails to specifically teach the sorting of the requests by requesters. The instant applicant discloses (column 2, line 15-26) that a "scheduling algorithm, often referred to as a 'fair' algorithm, attempts to schedule requests in a round robin fashion according to the various identities of the requestors associated with the requests such that each requestor in a system is able to use the DASD 'fairly', and not unduly stall other requestors attempting to access the DASD." The reference also fails to teach the sorting by the position to take place in the second queue.

13. It would have been obvious to one of ordinary skill in the art to combine the described instant applicant described fair algorithm with the two queue position sorting algorithm of Gallagher et al. to create a method which gathered access requests are sorted by requester to create a first ordered set, moved from a first queue to a second queue, sorted by relative position on a storage device to create a second ordered set, and issued and removed from a second cue, to give rise to a system which could give fairly and efficiently schedule access requests according to known methods. It also would have been obvious to one of ordinary skill in the art that the sorting by position could take place in either the first queue or the second queue of the disclosed system of the Gallagher et al. reference without changing the system function.

14. With regards to claim 20, the Gallagher et al. reference discloses the reversing of the queue direction (column 2, line 34-35) whenever an end is encountered.

15. With regards to claim 21, the Gallagher et al. reference discloses the reversing the sorting direction in ascending/descending order (column 2, lines 8-12 and 39-44) to create the well known elevator type schedule for access to the DASD.

16. With regards to claim 22, the Gallagher et al. reference teaches that a plurality of jobs or processors may make access requests and that the access requestors are computer tasks executing on the computer (column 1, line 8-22).

17. With regards to claim 23, the Gallagher et al. reference discloses a system for processing access requests, having two queues, a first queue for gathering (column 4, lines 1-3), a second queue for issuing (column 4, line 8-9), and the sorting by position method in one of the queues (column 3, line 12-15). The reference fails to teach the sorting by requestor in the first queue, but does cites the possibility of variance in order of execution of requests (column 1, line 26-32) to preferentially treat requests.

18. It would have been obvious to one of ordinary skill in the art at the time of invention, that the well known fair scheduling algorithm could be added into the system design in order to give fair access to storage device. It also would have been obvious to one of ordinary skill in the art that the sorting by position could take place in either the first queue or the second queue of the disclosed system of the Gallagher et al. reference without changing the system function. The Gallagher et al. reference also fails to disclose that control logic is responsible for the movement of access requests from one queue to the other. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that since the queues are connected only

through the disk driver (Fig. 3), it is inherent that there is control logic for queue to queue motion as part of the disk driver program.

19. With regards to claim 24, Gallagher et al. reference fails to teach the apparatus to further compromise a memory, and a processor coupled to the memory, where the processing program including control logic resident in the memory. However, it would have been obvious to one of ordinary skill in the art that Gallagher et al. does inherently include these limitations the drawing Figure 3. This figure shows a disk driver program located 320 on a CPU 301. It is therefore inherent to the Gallagher et al. disclosure that this program, including the control logic for motion between the attached queues, is located is located in a memory which is coupled to a processor inside the CPU 301.

20. With regards to claim 25, Gallagher et al. reference fails to teach the apparatus to further compromise an operating system, and a processing system including two queues located in the operating system. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that Gallagher et al. does inherently include these limitations the drawing Figure 3. This figure shows a disk driver program 320, and two queues 321 and 323 located on a CPU 301. It is therefore inherent to the Gallagher et al. disclosure that this program, including the queues, is located is located in an operating system, located in a memory which is inside the CPU 301.

21. With regards to claim 26, Gallagher et al. reference teaches that the apparatus includes a disk driver program that interfaces with the DASD. The reference fails to teach that the disk driver program is resident in an operating system and that the queues are resident in the disk driver. However, it would have been obvious to one of ordinary skill in the art at the time of the

invention that Gallagher et al. does inherently include these limitations the drawing Figure 3. The disk driver program 320 is located on the CPU 301, and is therefore inherently located in the operating system that controls it. The queues are shown to be connected to the disk driver program 320 on the CPU 301, and it is therefore inherent that they are a part of the program.

22. With regards to claim 27, Gallagher et al. reference teaches that the queues are in the CPU 301. The reference fails to teach that the queues are resident in the memory. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that Gallagher et al. does inherently include these limitations the drawing Figure 3. The queues are located on the CPU 301, and are therefore inherently located in the memory of the CPU.

23. With regards to claim 28, the Gallagher et al. reference teaches that a plurality of requests gathered, sorted according the relative positions of the access requests, and issued to a DASD. The reference fails to teach that the gathered requests should be sorted with the well known fair algorithm, but does teach that sorting to give preferential scheduling may first occur (column 1, line 26-32) to give a higher priority to certain requests. While a signal bearing medium bearing the program is not explicitly disclosed, Gallagher et al. does inherently include this limitation the drawing Figure 3. This figure shows a disk driver program located 320 on a CPU 301. It is therefore inherent to the Gallagher et al. disclosure that this program is located in a signal bearing medium, in this case the CPU 301.

24. With regards to claim 29, the Gallagher et al. reference does not explicitly teach that the signal bearing medium includes at least one of a recordable medium and a transmission medium. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that Gallagher et al. does inherently include these limitations the drawing Figure 3.

The program in located on the CPU 301, and are therefore inherently located in a signal bearing medium includes at least one of a recordable medium and a transmission medium, as the CPU will have some included memory, a recordable medium, and the shown transmission paths along with other inherent transmission type mediums.

25. Claim 3-8 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,644,786 to Gallagher et al. and the applicant admitted prior art, and in further view of U.S. Patent 5,931,912 to Wu et al. With regards to claim 3, the Wu et al. reference discloses the sorting by requestor to include the attempt to match the new requestor with a requestor currently waiting to be processed (column 7, lines 19-24), that if a match is found the new request is placed with the other entries form the same requestor (column 6, line 67, through column 7, line 6), and that if no match is found a new entry is made (column 7, lines 26-31). While the system of Wu et al. is used to map access and usage requests, it is not done in a system to provide fair and efficient access to a drive. It is done in a system to allow the accesses to such a device to be analyzed. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention, to combine the requestor based sorting and grouping methods of Wu et al. with the well known fair algorithm and the disclosed scheduling system of Gallagher et al. in order to allow a fair algorithm to minimally search an entire queue for like requestor identifiers.

26. Claims 4 and 5 are dependent on the combination of the Gallagher et al. and the Wu et al. references. With regards to claim 4, it is not disclosed by Gallagher et al. that after the position queue sorting is accomplished and the packet is sent onto be executed, a new set of data is received to be sorted by position. However, it is inherent to the system that moves between all queues occur in such a manner that the process of gathering and issuing is continuous. It would

have been obvious to one of ordinary skill in the art at the time of invention that the emptying of a queue is an indicator that it is ready to receive more requests for its assigned function. With regards to claim 5, it has been disclosed by the instant inventor that the well known fair algorithm utilizes a round robin approach to scheduling access requests. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the fair method to develop the highest priority packets of requests to be sorted by position by the system disclosed by Gallagher in order to implement an efficient elevator scheduling system.

27. Regarding claim 6, the Gallagher et al. reference teaches the moving of access requests as a packet of requests (column 2, line 39-45) and the reversing of a sort order for the next packet (column 2, line 34-35).

28. Regarding claim 7, the Gallagher et al. reference teaches the alternating of position sorting orders to try to maximize the efficiency of a DASD (column 2, line 8-12 and 39-44).

29. Regarding claim 8, the Gallagher et al. reference teaches that a plurality of jobs or processors may make access requests and that the access requestors are computer tasks executing on the computer (column 1, line 8-22).

30. With regards to claim 17, the Wu et al. reference discloses the sorting by requestor to include the attempt to match the new requestor with a requestor currently waiting to be processed (column 7, lines 19-24), that if a match is found the new request is placed with the other entries form the same requestor (column 6, line 67, through column 7, line 6), and that if no match is found a new entry is made (column 7, lines 26-31). While the system of Wu et al. is used to map access and usage requests, it is not done in a system to provide fair and efficient access to a drive. It is done in a system to allow the accesses to such a device to be analyzed. Therefore, it

would have been obvious to one of ordinary skill in the art at the time of invention, to combine the requestor based sorting and grouping methods of Wu et al. with the well known fair algorithm and the disclosed scheduling system of Gallagher et al.

31. With regards to claim 18, it is not disclosed by Gallagher et al. that after the position queue sorting is accomplished and the packet is sent onto be executed, a new set of data is received to be sorted by position. However, it is inherent to the system that moves between all queues occur in such a manner that the process of gathering and issuing is continuous. It would have been obvious to one of ordinary skill in the art at the time of invention that the emptying of a queue is an indicator that it is ready to receive more requests for its assigned function, in order to facilitate good request flow.

32. With regards to claim 19, it has been disclosed by the instant inventor that the well known fair algorithm utilizes a round robin approach to scheduling access requests. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the fair method to develop the highest priority packets of requests to be sorted by position by the system disclosed by Gallagher, in order to allow fast and even processing of requests.

Conclusion

32. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joshua D Schneider whose telephone number is (703)-305-7991. The examiner can be reached from Monday through Friday.

33. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffery Gaffin can be reached at (703)-308-3301. The fax phone numbers for the

organization where this application or proceeding is assigned is (703)-746-7239 for regular communications and (703)-746-7238 for After Final communications.

34. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-305-3900.

JEFFREY GAFFIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100